

IDAHO DEPARTMENT OF FISH & GAME

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EVALUATION OF TRANSPLANTING SNAKE RIVER
STEELHEAD TROUT TO THE PAHSIMEROI RIVER, 1978
Period Covered: 1 July 1977 to 30 June 1978

by

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EVALUATION OF TRANSPLANTING SNAKE RIVER
STEELHEAD TROUT TO THE PAHSIMEROI RIVER, 1978

ABSTRACT

Returning marked adult steelhead from 1976 feed experiments showed double the returns from smolts fed an Oregon Moist Pellet diet over those reared on dry feed.

Grading steelhead smolts to favor fast growing "leaders" in 1976 led to increased adult returns in 1978.

Adult steelhead excess to program needs were transported and released in various locations in the Salmon River drainage. Many of these fish spawned successfully, close to the area of liberation, with some penetration into adjacent tributary streams.

Spawn-taking procedures at the Pahsimeroi station were modified in 1978 with the goal of improving the hatchery product and increasing the smolt to adult return ratio.

The steelhead sport fishery in the Salmon River for the 1977-78 fish run was one of the most intense and successful in many years. Check station data indicated that anglers fishing the Salmon River above the South Fork harvested an estimated 60% of the hatchery run (4,200 fish).

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INTRODUCTION

The Niagara Springs Steelhead Hatchery and Pahsimeroi Steelhead Collection Facility operations are part of Idaho Power Company's obligation to relocate steelhead and salmon stocks from the Snake River to the Salmon River because of inundation and blockage of their ancestral migration routes and spawning beds by Hells Canyon Dam.

This project was initiated in 1966, with the release of the first steelhead smolts from fish trapped at the base of Hells Canyon Dam. Present project operations include obtaining steelhead eggs from adults returning to the Pahsimeroi station from prior smolt releases, incubating the eggs to the advanced eyed stage and shipping them to Niagara Springs Hatchery near Wendell, Idaho, for hatching.

The steelhead fry are placed in raceways at Niagara Spring Hatchery and reared until the following spring when they are trucked back to the Pahsimeroi River and released as seaward-bound smolts.

OPERATIONS AND RESEARCH - 1978

Delivery of Fish

Approximately 1,266,000 steelhead juveniles were transported and released in the Pahsimeroi River from Niagara Springs Hatchery in 30 truckloads between 20 March and 26 April 1978. All fish were released directly into the river near the adult steelhead weir site. In addition, 34,200 smolts were transported from Dworshak National Fish Hatchery and released in the Pahsimeroi at the weir site on 18 April 1978.

Of the 1,266,000 Niagara Springs-reared smolts delivered in 1978, 1,220,800 were 1977 brood year Pahsimeroi River-stock from eggs taken from the adult steelhead that returned to the weir in the spring of 1977. The balance of the release consisted of 24,300 fish that were 1977 brood year Dworshak-origin steelhead hatched and reared at Niagara Springs from eggs, and 20,900 that were 1977 Dworshak-origin fish delivered as fry to Niagara Springs Hatchery in October, 1977. The Dworshak-origin steelhead were part of a research experiment to investigate the effects of hatchery imprinting on homing ability.

Homing Research

In the spring of 1977, a small number of adult steelhead that entered the facilities at Dworshak National Fish Hatchery on the Clearwater River carried fin clips that indicated possible Niagara Springs-Pahsimeroi origin. The 1974 smolt release from Niagara-Pahsimeroi were reared from Dworshak fingerlings delivered in October 1973, and speculation arose concerning early imprinting and its effects on homing behavior.

To investigate that phenomena, four groups of coded wire tagged smolts were released in the Pahsimeroi River in April 1978. One group consisted of smolts hatched and reared at Niagara Springs Hatchery from eggs taken at Dworshak NFH in the spring of 1977. A second group of smolts were reared from steelhead

fry hatched and raised to 343/kg (156/lb) at Dworshak NFH and delivered to Niagara Springs in October 1977. A third group of smolts were Pahsimeroi-origin Niagara-reared steelhead to serve as experimental controls. A fourth group of smolts hatched and reared at Dworshak NFH were transported from that hatchery and released directly in the Pahsimeroi River in April 1978.

These releases will compare adult returns to the Pahsimeroi from:

1. Niagara-reared Dworshak-origin smolts from eggs.
2. Niagara-reared Dworshak-origin smolts from 4-month reared Dworshak fry.
3. Niagara-reared Pahsimeroi-origin smolts (control).
4. Dworshak-reared Dworshak-origin smolts.

The three groups of fish reared at Niagara Springs (egg origin, fry origin, and controls) were marked with a coded wire tag in October 1977. Tags were applied to approximately 40,000 fish from each group.

In the winter of 1977-78, a severe disease outbreak at Niagara Springs caused high mortality among all fish on the station. The loss among the experimental groups that had been handled and stressed during the coded wire tagging operation was higher than the untagged fish on the station and ran as high as 39%. Growth of the tagged fish was retarded compared to unhandled fish and upon delivery to the Pahsimeroi in April, all three groups averaged approximately 32/kg (14.5/lb) and 150 mm (5.9 in) total length. These three Niagara-reared groups, while directly comparable with each other, were not as large or healthy as the normal annual product from Niagara Springs Hatchery. A large portion of these fish were below the 170 mm (6.7 in) minimum length necessary for good emigration and adult returns may be low. Symptoms of Furunculosis and Red-throat diseases were present in the smolts at release.

The smolts delivered to the Pahsimeroi directly from Dworshak NFH were in good health and averaged 19/kg (8.5/lb) and 177 mm (7.0 in) total length.

The difference in the size and health between the Dworshak and Pahsimeroi smolts must be considered when evaluating adult returns in 1980, 1981, and 1982.

Adult Steelhead Spawn-taking Procedures

Past work on the Pahsimeroi program has repeatedly shown that a minimum sized smolt of 170 mm (6.7 in) appears to be necessary to ensure good downstream emigration and adult returns. In order to culture the annual smolt production at Niagara Springs Hatchery to meet that goal to the maximum level possible, two factors emerge above all others: the elimination of excess numbers of fry over that needed for production, and an advancement and compression of the time range over which eggs are delivered to the hatchery.

Delivering more eyed eggs to the hatchery than is needed to meet the production quota leads to overcrowding of fish, increased incidence of disease, greater size variation, lower growth rates, increased workload, elevated feed costs and, eventually, higher total fish loss and a poorer quality smolt.

The past policy of taking the eggs from all female steelhead entering the Pahsimeroi trap often resulted in "overloading" the Niagara Springs Hatchery system and at times hindered the potential of that station for approaching the 170 mm (6.7 in) total length minimum for its final product.

Past egg taking-rearing procedure at the Pahsimeroi-Niagara Springs facilities has also included rearing juveniles from all segments of the returning adult run; from the earliest to the last fish to arrive. This usually led to a time spread of nearly 2 months between the first and last fry hatches at the station. Two months rearing time can make a significant difference in final size at Niagara Springs Hatchery and can mean the difference between a smolt or non-smolting fish. The wide time span between first and last egg takes also creates space and grading problems, contributes to cannibalism, and increases work loads.

The popular argument for taking eggs from all portions of a fish run is to attempt to maintain genetic diversity and prevent the possible loss or severe reduction of the early and late arriving or ripening segments of the population. This reasoning is based on two premises: one; if the fish were ever to be re-introduced to their primary environment they may not be as suited as they originally were, and two; if downstream factors eliminated a segment of the run as it passed through the Columbia or Snake River, then there would be other segments to survive. I do not consider either of these factors to be an overriding consideration. The first premise is no longer a possibility and neither the downriver passage conditions or the degree of genetic selection at the Pahsimeroi is so severe as to cause a threat from the second.

Commencing in the spring of 1978, a modified spawntaking procedure was initiated at the Pahsimeroi facilities which I believe will result in increased smolt quality and adult returns to that station. Basically, this consisted of delivering eggs to Niagara Springs Hatchery from the forward main body of the run only. The first few small egg takes from the small number of early ripening adults were not delivered to Niagara Springs. When the main body of the run ripened up, the Niagara Springs needs (2 million eggs) were delivered to the hatchery. When the quota was fulfilled the remaining adults were transported to various locations on the upper Salmon River and tributaries and released to spawn naturally.

In 1978, this resulted in all eggs delivered to the Niagara Springs incubators within a 16-day period.. The incubation-hatching-starting phase was considerably compressed over prior years and the result was a more uniform and larger product at the time of this report (January 1979).

Obviously the program will vary with the size of the annual adult return. Some years of low runs will require that all eggs from all female be taken and the time range will be correspondingly wide. Years of high returns, such as 1978, may result in all eggs delivered within a 2-week period.

I believe this program will result in increased numbers of adult steelhead returning to the Pahsimeroi River for less cost in materials, supplies and labor at the hatchery. Some increased cost for transporting adults out of the Pahsimeroi facilities to upriver locations will be necessary but will result in enhancing the upper Salmon River steelhead sport fishery and will seed presently

under utilized anadromous fish habitat with naturally rearing juvenile steelhead.

Adult Hauling

After all eggs were taken to satisfy program needs, 1,833 excess adult steelhead were transported by tank truck to various locations in the Salmon River drainage (Fig. 1). To monitor the amount of return to the Pahsimeroi weir and prevent double-counting of adults, the transported fish were given an identifying mark by making holes in the opercle with a paper punch. All adults entering the Pahsimeroi trap were inspected for marks and the presence of any opercle punches were noted. The first time a marked steelhead reentered the Pahsimeroi trap it was given an additional mark and the fish again transported upstream.

Out of 1,568 adult steelhead transported to locations upstream from the Pahsimeroi River, 26 (1.6%) were recaptured at the trap. Of these 26 fish, 22 (85%) were males. Only one fish returned a second time. In general, the fish transported further distances returned in fewer numbers than those released closer to the Pahsimeroi.

Those steelhead released in both the Pahsimeroi River (205) and Lemhi River (60) were released upstream of a weir and could not return back downstream out of those rivers (Table 1).

Adult Radio Tracking

Because relatively large numbers of adult steelhead were being transported to upstream areas in the spring of 1978, we felt the need to learn whether these fish would spawn successfully in a wild situation and to attempt to delineate the degree of straying after release prior to spawning.

On 6 April 1978, we installed miniature radio transmitters in four female adult steelhead taken from the holding pens at the Pahsimeroi trap. The four fish were transported up the Salmon River about 96 km (60 mi) and released in the main river at Robinson Bar bridge. Two hours after release all four radio signals could be heard on a portable receiver mounted in a vehicle. Effective range was approximately .4 km (1/4 mi) (Fig. 2 3). Periodic tracking runs were conducted to monitor the movements of the four fish. No signal was detected longer than 9 days after the release date.

Steelhead number 1 (frequency 3.33) did not move from the Robinson Bar hole, where it was released, for 4 days (6-9 April). Tracking searches after that date failed to locate that fish again.

Steelhead number 2 (frequency 6.43) was located 4.2 km (2.6 mi) downstream the second day after release, 10.2 km (6.4 mi) downstream from the release point on the fourth day after release and then was never located again.

Steelhead number 3 (frequency 7.22) remained at the release site for 2 days after release, was found .3 km (.2 mi) upstream on day four, and .3 km (.2 mi) downstream on day seven. On the ninth day after release (14 April), the transmitter signal indicated the fish was in the same location as on the seventh day. There was no further contact after that date.

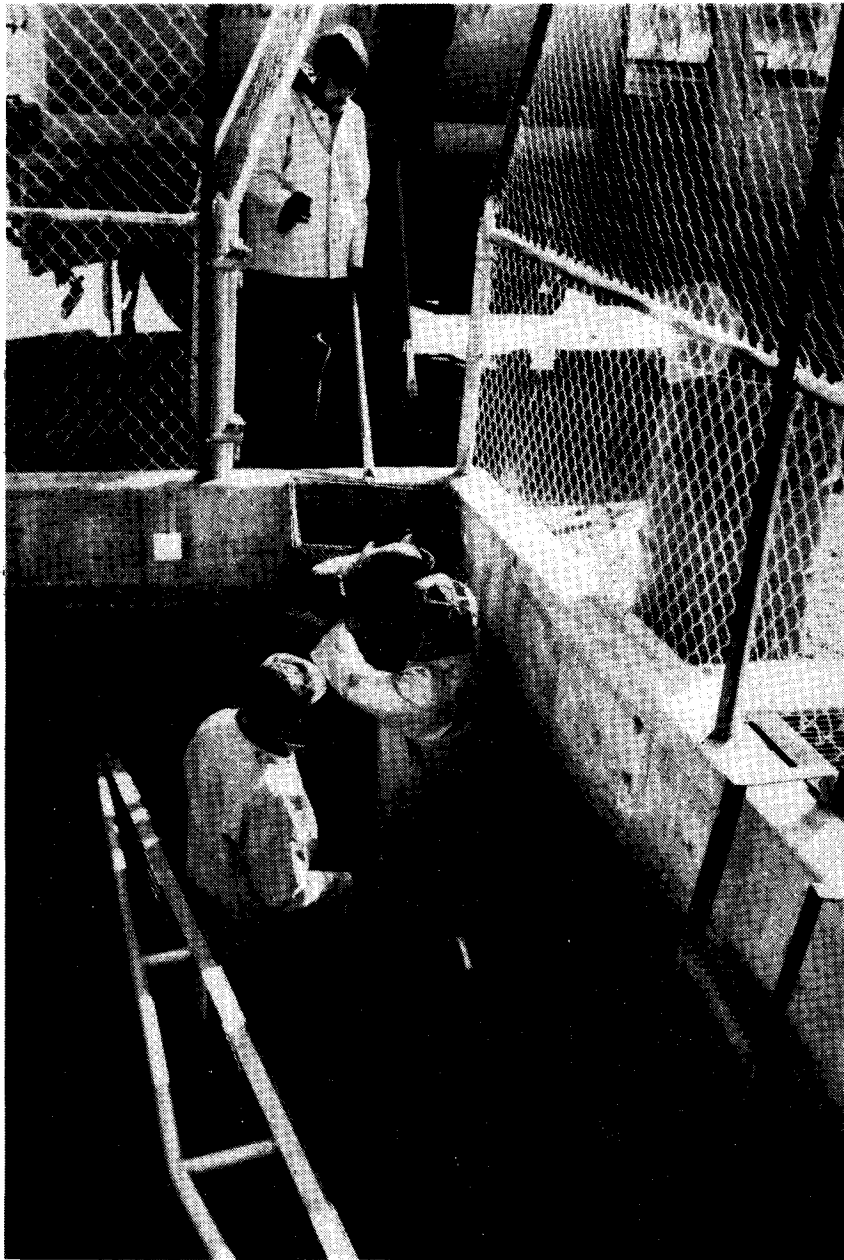


Figure 1. Over 1,800 adult steelhead excess to the needs of the Niagara-Pahsimeroi project were transported and released in the upper Salmon River drainage.

Table 1. Numbers of adult steelhead released in various locations in the Salmon River drainages, distances transported and returns to the Pahsimeroi weir.

Release area	Approximate distance from Pahsimeroi R.	No. of fish released	Punches on left or right opercle*	Sex, No. & No. of times returned to Pahsimeroi R.	
				1	2
East Fork Salmon River	64 km (40 mi)	750	1R, or 2R	M-2 F-1	
Mid Salmon River (Robinson Bar)	96 km (60 mi)	200	1L	M-5 F-1	
Valley Creek	120 km (75 mi)	200	1R, 1L	M-10 F-0	M-1
Upper Salmon R. (Decker Flat)	136 km (85 mi)	418	2L 1L, 2R	M-5 F-2	
Lemhi River	56 km (35 mi) downstream	60	None	Released above Lemhi weir Zero recaptures.	
Pahsimeroi	released from trap upstream	<u>205</u>	None		
Total		1,833		26	1



Figure 2. Radio tracking adult steelhead was limited to a distance of approximately .4 km (1/4 mi) from the fish.



Figure 3. A vehicle with an externally mounted antenna allowed us to search and track from the road along the Salmon River.

Steelhead number 4 (frequency 9.20) was located 1.3 km (.8 mi) upstream on the second day, back at the point of release on the fourth day and 1 km (.6 mi) downstream on the seventh day. The area where fish number 4 was located on the seventh day is known locally as "Indian Riffle" and is one of the best anadromous fish spawning areas in that section of the river, commonly used by both steelhead and salmon. Although a visual sighting could not be made, the area that the signal was emanating from was a likely area for redd building and spawning. Another tracking run 2 days later failed to locate that fish again, and no further contacts were made although periodic searches continued for over 80 km (50 mi) on either side of this last contact until 26 April, 14 days later.

Field checks showed fish on newly constructed redds and actively spawning in the immediate release areas on the East Fork of the Salmon River within a few days after liberation (Fig. 4). Adult steelhead were seen spawning in Lyon Creek and Slate Creek, small Salmon River tributaries in close proximity to the Robinson Bar release area. Wild steelhead spawners had not been seen in these streams for many years and it appears these were transported Pahsimeroi fish.

National Marine Fisheries Service (NMFS) personnel operating downstream migrant collection facilities at Lower Granite dam reported seeing several spawned out adult steelhead with opercle punch marks. No accurate records were kept on numbers or marks however (personal communication, Larry Basham, NMFS).

It appears that the steelhead transported to other areas from the Pahsimeroi River spawned successfully under natural conditions, and limited evidence suggests spawning occurred in close proximity to the area of liberation and some penetration of adjacent tributary streams occurred.

MARKED ADULT RETURNS

Hatchery Feeding - Smolt Behavior Experiment

In March 1976, we released four marked groups of 1975 brood year, Niagara Springs-reared, Pahsimeroi-origin steelhead smolts as part of a feed-smolt behavior research experiment.

Groups number 1, 2 and 3 were all hatched from the same egg take. Group number 4 were fish hatched from the earliest egg takes and were intensely graded during the rearing process to produce the largest smolt possible.

Groups 1, 2 and 3 are directly comparable. Groups 1 and 2 average 198 and 199 mm (7.8 in) total length at release and group 3 averaged 215 mm (8.5 in). All three groups averaged well above the 170 mm (6.7 in) minimum size needed for good emigration. I do not consider the 16-17 mm (0.6-0.7 in) size difference between groups 1 and 2 and group 3 significant enough to account for the difference in return numbers between these three groups. However, to correct for the percent of the population less than 170 mm (6.7 in) total length I recalculated the length frequency of groups 1, 2 and 3, eliminating those fish less than 170 mm. The modified length frequencies are as follows:



Figure 4. Steelhead released in the East Fork of the Salmon River were observed actively constructing redds and spawning in the vicinity of the release area.

	<u>Group #1</u>	<u>Group #2</u>	<u>Group #3</u>
Range:	170-279 mm	170-289 mm	170-289 mm
Average	212 mm	212 mm	220 mm
% of release:	80%	83%	92%
Total released:	24,500	25,300	25,200
Corr. rel. no.:	19,600	21,000	23,200

The corrected release number is the actual number of smolts over 170 mm released into the Pahsimeroi River. Assuming that fish less than 170 mm did not contribute to adult returns in any significant amount, this then makes the smolt-adult return percentage directly comparable between groups 1, 2 and 3 as so:

	<u>Group #1</u>	<u>Group #2</u>	<u>Group #3</u>
Corr. rel. no.:	19,600	21,000	23,200
Adult ret.:	29	28	67
Return %:	.15	.13	.29

Group #1, the control group, was started and reared for the entire hatchery cycle on dry feed. Group #2 was started on Oregon Moist Pellets (OMP) feed and reared on OMP until they were approximately 51/kg (23/lb) in October of 1975, and then switched to a dry diet for the remainder of the rearing phase. Group #3 was reared entirely on OMP from start to finish. Group #4 was reared entirely on dry feed. Downstream migration monitoring in the spring of 1976 showed group #3 migrating 2 weeks earlier than the other groups. I attributed this behavior to final diet (Reingold 1977).

The 1-ocean returns from these four groups arrived back at the Pahsimeroi weir in the spring of 1978 and were checked in the upper Salmon River sport catch in the fall of 1977 and spring of 1978 (Table 2).

Table 2. Numbers of marked adult steelhead counted at the Pahsimeroi weir and in the upper Salmon River sport catch, fall 1977 - spring 1978.

	<u>Group #1*</u> RVAd (dry)	<u>Group #2</u> RV (OMP/dry)	<u>Group #3</u> LVAd (OMP)	<u>Group #4</u> LV (Large-dry),
Weir	29	28	67	218
Sport	6	15	9	34
Total	35	43	76	252

*This group of fish was utilized as an experimental control.

The fish fed 100% OMP showed considerably larger returns (93-123%) than the other two groups. These fish displayed an earlier (stronger?) emigration behavior when released as smolts in 1976 (Reingold 1977). If we relate this to a 1,000,000 fish smolt release it would mean 2,900 adults back to the weir versus 1,500 or 1,300 for groups 1 and 2 respectively.

Group number 4, the "premium leaders" of the 1975 brood-year, returned at a phenomenal rate of .87%. These fish were a true minimum size 170 mm smolt. They ranged in size from 170 mm-319 mm (6.7-12.6 in total length and averaged 238 mm (9.4 in). Their feeding regime is comparable to the control group #1; both were reared on a 100% dry diet. These were the most vigorous, fastest growing fish on the station and I believe this is reflected in the .87% return percentage. They did not display the 2-week earlier emigration behavior as did the OMP fed group #3 (the second highest return). It is interesting to speculate on what the return would have been on this group of fish had they been reared on a 100% OMP diet.

The results of this experiment indicate that:

1. Feeding Niagara Springs steelhead smolts an OMP diet improved adult returns. This may be related to final diet however, rather than total diet.
2. Past work indicating a minimum size of 170 mm as the lower limit for steelhead smolts is further strengthened.
3. Grading steelhead smolts to favor fast growing "leaders" led to increased adult returns.

The average size difference for 170 mm and longer fish between group 1 and group 4 was 18 mm (0.7 in). I am inclined to favor vigor primarily, rather than this relatively small size differential for the difference in returns between these two groups.

Experiments to further explore the effects of OMP as a final diet were initiated on the 1976 brood year - 1977 released smolts. Adults from these experiments are expected to return to the Pahsimeroi in the spring of 1979.

NMFS Transport Evaluation

One hundred and three adult steelhead that returned to the Pahsimeroi weir in the spring of 1978 carried color-coded wire tags in their snouts that were implanted by National Marine Fisheries Service personnel at Lower Granite and Little Goose dams in the spring of 1975 and 1976. This was done to evaluate the effects of transporting seaward bound smolts around the Snake and Columbia River dams versus allowing them to pass downstream through all the systems (controls).

The results from this program are shown in Table 3.

Table 3. Summary of color-coded wire tag recoveries from adult steelhead that returned to the Pahsimeroi station in 1978.

	Lower Granite Dam 1975, releases	Lower Granite Dam 1976 releases	Little Goose Dam 1976 releases	Combined releases
Transports	4	40	39	83
Controls	0	11	9	20
Totals		51	48	103

NMFS data indicates approximately a 1.5:1 overall benefit for steelhead transported in 1976 versus those not transported. This is a much lower benefit ratio than in past years. NMFS personnel attribute this primarily to a change in the transport tanker release location due to construction work below Bonneville Dam (personal communication, Emil Slatick, NMFS).

ADULT RETURNS

1974 Release - 1973 Brood Year (Clearwater Race)

In the spring of 1976, I identified 395 adult steelhead that returned to the Pahsimeroi station as 1-ocean adults from the spring 1974 release of Clearwater stock smolts. This was the first return of this stock of steelhead substituted for the Pahsimeroi progeny lost as a result of an IPN epizootic at Niagara Springs Hatchery in 1973.

In the spring of 1977, I identified 74 adult steelhead that entered the Pahsimeroi trap as 2-ocean Clearwater stock returns. These were considerably fewer returns than expected as work done on the Clearwater River and at Dworshak National Fish Hatchery has shown that the majority of this race of steelhead (75-85%) return as 2-ocean adults there. The reasons for this lack of 2-ocean returns are not apparent. A selective downriver net fishery could possibly contribute to it. Perhaps-hatchery rearing practices affect return behavior. Some research into this phenomenon could possibly be initiated.

In the spring of 1978, an estimated 29 additional steelhead adults from this release returned as 3-ocean fish. The total return to the hatchery, excluding any contributions to the sport catch was 498 fish (.03%). This is the lowest smolt to adult return ratio yet experienced at the Pahsimeroi station since the initiation of the program.

These results, coupled with similar findings from other upper Salmon River research work indicate that the use of Clearwater River race steelhead for substitution, replacement or enhancement of established Salmon River runs must be approached with caution. Their suitability and adaptability may be within

relatively tight constraints. Coded wire tagging experiments initiated in 1978 will further explore this phenomenon.

1975 Release - 1974 Brood Year

In the spring of 1975, we released 1,331,000 Pahsimeroi-origin smolts, reared at Niagara Springs Hatchery, in the Pahsimeroi River. I estimated that 1,395 of these steelhead returned as 1-ocean adults in the spring of 1977.

In the spring of 1978 I classified an additional 533 2-ocean returnees as being from this smolt release. I do not expect any significant returns of 3-ocean fish from this release. This brings the total brood year return to the weir (not including sport harvest) to 1,928 fish (.14%).

1976 Release - 1975 Brood Year

In the spring of 1976, we released 1,610,000 Niagara-reared steelhead smolts into the Pahsimeroi River. The 1-ocean adults from this release returned to the Pahsimeroi in the spring of 1978. We classified 2,242 fish counted through the trapping facilities as adults from this brood year. Additional 2-ocean adults are expected to return in the spring of 1979 (Table 4).

Of the 2,803 adult steelhead counted into the facilities in 1978, 1,550 were females (55.3%), and 1,253 (44.7%) were males.

DORSAL FIN DEFORMITY RECOGNITION

In the spring of 1978, I inspected 362 adult steelhead spawner carcasses to determine the degree of dorsal fin deformity. I classified the fins into three categories:

Class I - Strongly deformed, easily recognizable.

Class II - Moderately deformed, recognizable with education.

Class III - Slight deformity or none, not recognizable. I

classified the 362 inspected fish as follows:

Class I - 323 (89%)

Class II 35 (10%)

Class III - 4 (1%)

Ninety-nine percent of the 1978 hatchery adult returnees were recognizable by deformed dorsal fins.

STEELHEAD ANGLER CHECK STATIONS

The steelhead sport fishery in the Salmon River for the fall 1977 spring 1978 fish run was one of the most intense and successful in many years. Estimates drawn from check station data indicate that anglers in the Salmon River above the South

Table 4. Releases, returns, marks used, etc. of the Niagara Springs-Pahsimeroi River steelhead relocation program, 1973-1978.

Brood year Year released	Number steelhead released	Number marked	Marks used	No. adults returned to weir as:			Total brood year to weir	Marked adult returns	Total weir count (year)	Est. sport harvest (fish-year)
				1-year ocean	2-year ocean	3-year ocean				
1972 1974	242,000	25,000	LV (2-year pond)	(82%) 156 (1976)	(18%) 35 (1977)	0 (1978)	191	LV 22	585 (1976)	(est.) 38 (76-77)
1973 1974	1,607,000 (Clear-water race)	20,000 20,000 20,000	LVAd (Mar.) RVAd (Apr.) RV (May)	(79%) 395 (1976)	(15%) 74 (1977)	(6%) 28 (1978)	497	LVAd 3 RVAd 1 RV 11	1,504 (1977)	(est.) 1,603 (76-77)
1974 1975	1,331,000	20,000 20,000 20,000	LVAd (Mar.) RVAd (Apr.) RV (May)	(72%) 1,395 (1977)	(28%) 533 (1978)	(1979)	1,928	LVAd 10 RVAd 17 RV 30	2,803 (1978)	(est.) 4,200 (1977-78)
1975 1976	1,610,000	25,000 25,000 25,000 25,000	LVAd (OMP) RVAd (dry) RV (OMP/dry) LV (large)	2,242 (1978)	(1979)	(1980)		LVAd 67 RVAd 29 RV 28 LV 218	(1979)	
1976 1977	1,448,000	54,000 52,000 51,000 15,000	CWT (OMP-14) CWT (OMP-30) CWT (Dry) CWT (Trans.)	(1979)	(1980)	(1981)		OMP-14 OMP-30 Dry Trans.	(1980)	
1977 1978	1,266,000	24,300 20,900 31,300 34,200	CWT (D. eggs) CWT (D. fry) CWT (Control) CWT (D. smolts)	(1980)	(1981)	(1982)		D. eggs D. fry Control D. smolts	(1981)	

Fork harvested an estimated 60% of the hatchery run, about 4,200 fish.

During the fall fishery we identified 65.5% of the 580 steelhead inspected at the station as hatchery origin. During the spring fishery the ratio of hatchery to wild fish was 80.7%.

Table 5. Summary of data collected at the steelhead angler check station operated near North Fork, Idaho, October-November 1977.

Dates	Anglers	Hours	Steelhead		Hours per fish	Percent hatchery
			Kept	Released		
10/1-2	187	988	11	1	82.3	55
10/8-9	150	802	19	1	40.1	42
10/15-16	197	1,014	48	17	15.6	56
10/22-23	239	1,392	77	15	15.1	77
10/29-30	309	2,735	127	16	20.7	66
11/5-6	329	2,749	164	33	13.9	68
11/11-12	340	2,845	107	35	20.0	70
11/19	98	506	27	0		70
Totals	1,849	13,031	580	118	18.7	65.5

Table 6. Summary of data collected at the steelhead angler check station operated near North Fork, Idaho, February-March, 1978.

Date	Anglers	Hours	Steelhead		Hours per fish	Percent hatchery
			Kept	Released		
2/18-19	202	1,030	52	3	18.7	79
2/25	51	275	17	0	16.1	76
3/4-5	248	1,542	63	6	22.3	90
3/18	82	567	19	0	29.8	58
Totals	583	3,414	151	9	21.3	80.7

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LITERATURE CITED

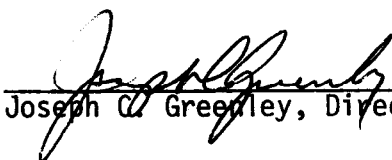
Reingold, M. 1977. Evaluation of transplanting Snake River steelhead trout to the Pahsimeroi River, 1976. 1 July 1975 to 30 June 1976. Idaho Dept. of Fish & Game Report.

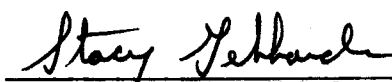
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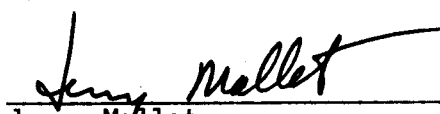
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